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HANDBOOK
OPERATION AND SERVICE INSTRUCTIONS

RADAR RECORDING TEST SET

MODEL 1M18

MAST DEVELOPMENT COMPANY
2212 East Twelfth Street
Davenport, Iowa

**THIS IS TO BE USED AS PRELIMINARY DATA UNTIL
SUCH TIME AS FINAL DATA IS AVAILABLE.**

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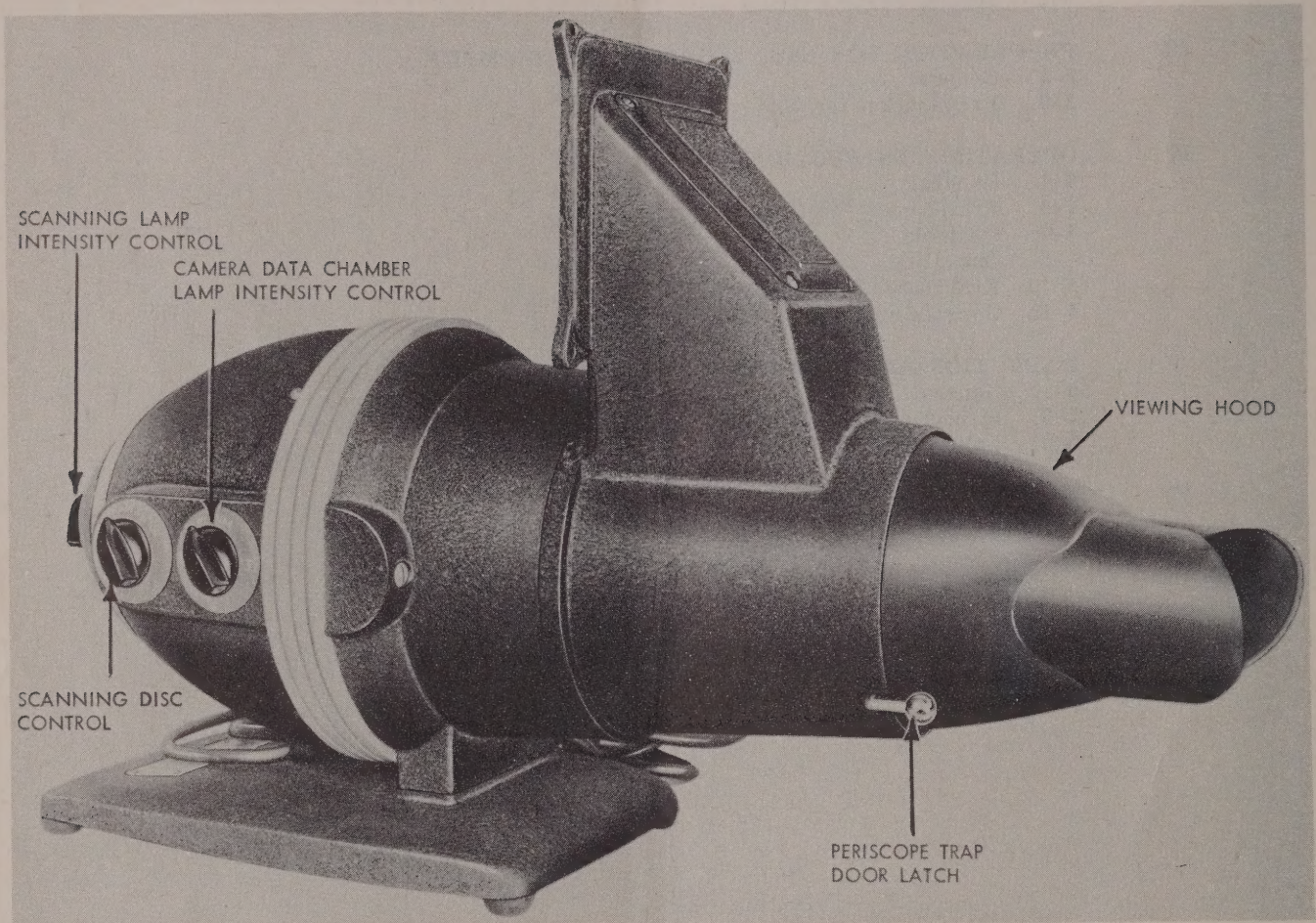


Figure 1-1. Overall View of Radar Recording Test Set LM18

SECTION I

INTRODUCTION

1-1. SCOPE.

1-2. This handbook gives the operation and maintenance instructions for the Radar Recording Test Set LM18, manufactured by Mast Development Company, Davenport, Iowa.

1-3. PURPOSE.

1-4. The Radar Recording Test Set is used to test operation and function of the 0-15, 0-22, and 0-30 Radar Recording Cameras. With suitable mounting adaptors and cables, the test set may also be used to test the 0-2 and the 0-32 recording cameras.

1-5. PRINCIPLES OF OPERATION.

1-6. The Radar Recording Test Set is a unit designed for bench testing the function and operation of radar recording cameras. The camera to be tested is mounted on the test set. The test set functions to provide a simulated radar sweep which travels at a known velocity, tripping the camera shutter open and closed during each cycle. The simulated sweep trace is achieved by rotating a perforated disc between a light source and the camera lens. The perforations are arranged in a typical sweep trace pattern. When the disc is rotated, a series of concentric circles are exposed on the film in the camera. This film is processed and then examined. Viewing the processed film provides functional information regarding the camera operation. The shape of the sweep trace pattern will indicate film shift during exposure, characteristics of shutter operation (shutter bounce, shutter not opening, shutter not closing), and the interval of time that the shutter is closed.

1-7. DESCRIPTION.

1-8. The test set is a bench mounted mechanical device that generates a timed, simulated radar sweep trace in conjunction with a synchronized pulse to the camera shutter mechanism. The unit consists of the assemblies shown in figure 1-2.

1-9. PERISCOPE ASSEMBLY. The periscope assembly consists of a cast aluminum periscope housing and associated optical components. The function of the optical system is to provide a means for both the operator and the camera simultaneously to view the sweep trace. The camera is attached to the periscope by four bolts, and the periscope is attached to the subsequent subassembly, the Adaptor and Base Assembly, by six screws. An access door on the left side of the periscope is provided for an anticipated future focusing requirement.

1-10. PERISCOPE ADAPTOR AND BASE ASSEMBLY. This assembly is divided into two main units: the adaptor and the base. The base serves as a pedestal for the entire test set to rest upon. It is mounted upon four rubber bumpers. Two 3/8-inch by 1-1/2-inch bolts attach the base to the adaptor. The adaptor is attached to the Center Section Assembly by two Dzus fasteners, and correct orientation of the two units is determined by an aligning dowel.

1-11. SCANNING DISC ASSEMBLY. The Scanning Disc Assembly provides the visual sweep-trace. A straight line pattern of holes is drilled into the disc. The holes progressively increase in diameter as the periphery of the disc is approached in order that the light emitted to the film from each hole is equal despite the linear velocity difference along the radius. A 25-watt lamp is mounted directly behind the trace

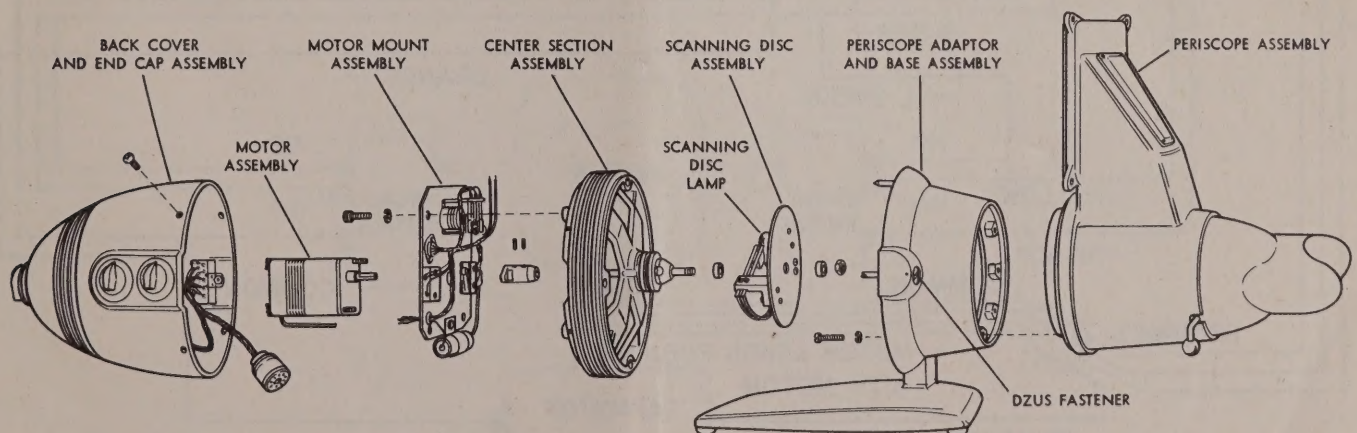


Figure 1-2. Exploded View of Radar Recording Test Set

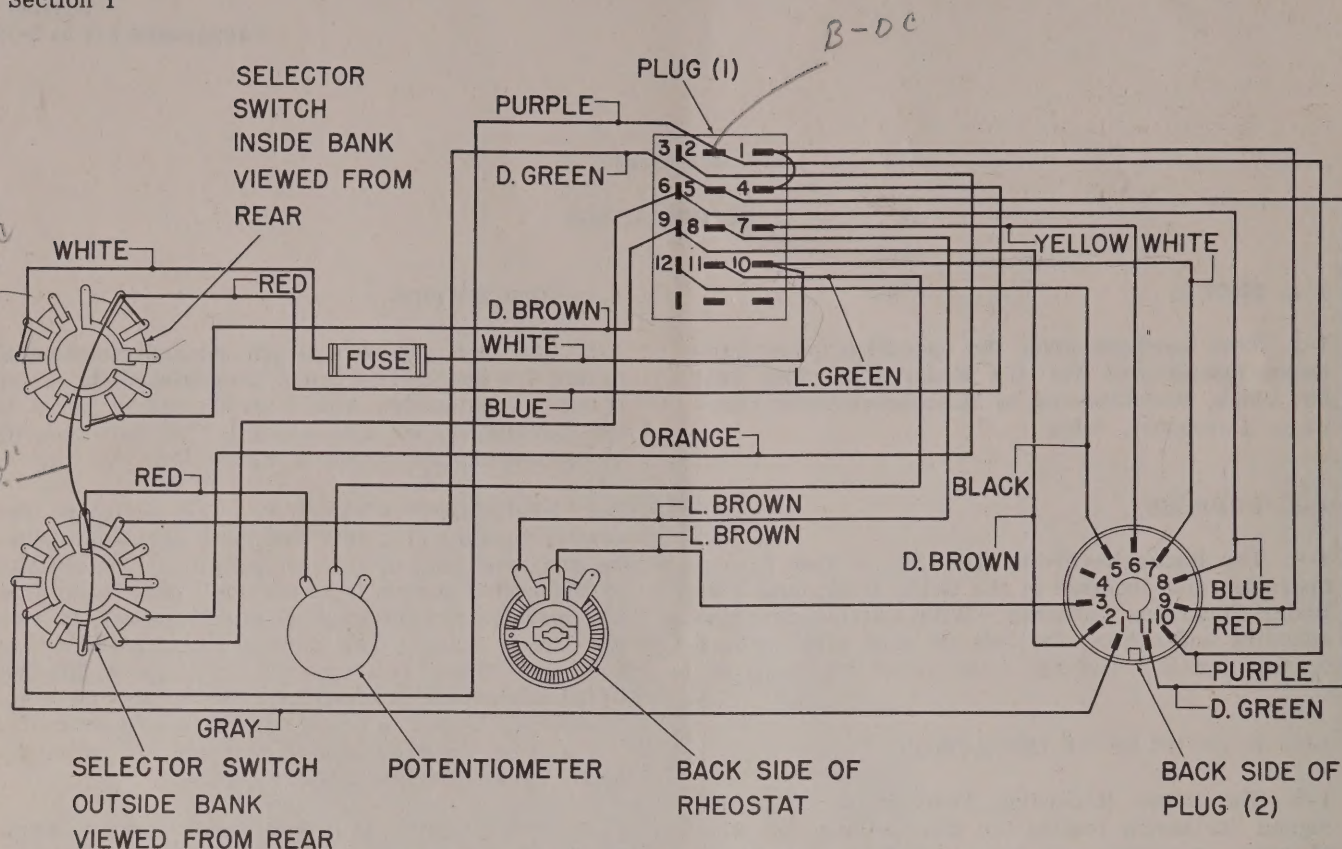


Figure 1-3. Wiring Diagram of Back Cover Harness

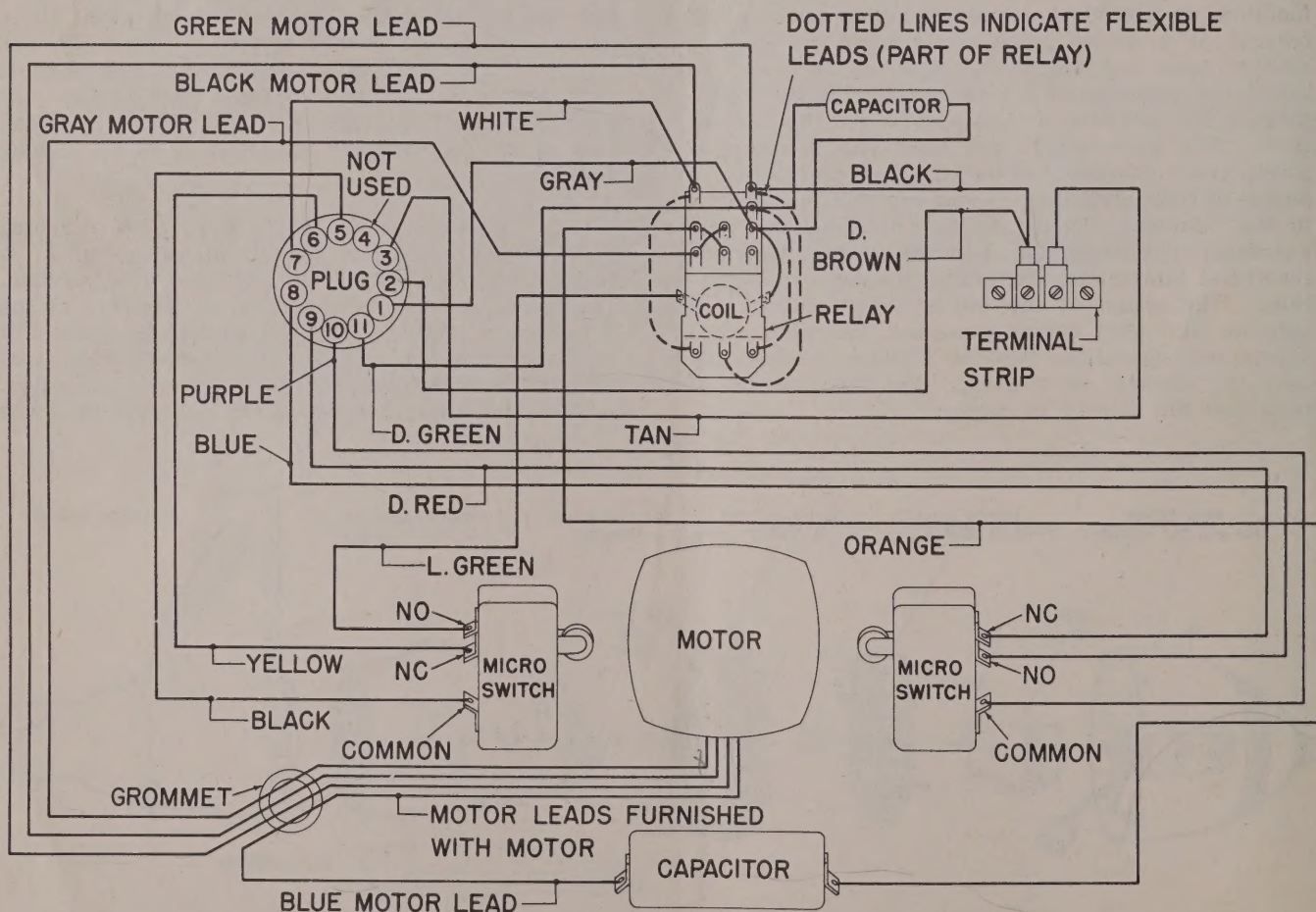


Figure 1-4. Wiring Diagram of Motor Mount Harness

of holes. Between the lamp and trace is a light filter. Attached to the disc is a pair of brushes to conduct current from the commutator to the lamp.

1-12. CENTER SECTION ASSEMBLY. The center section is an aluminum casting which provides a mount and bearing for the drive shaft. The commutator, scanning disc, and micro switch drive coupling are mounted upon the drive shaft.

1-13. MOTOR MOUNT ASSEMBLY. The Motor Mount Assembly includes the plate which attaches the assembly to the center section, the drive motor, micro switches, micro switch drive coupling, and the relay. As the motor rotates, the coupling, in a cam-like manner, operates the micro switches

which in turn, through the relay, both reverse the motor and pulse the camera shutter mechanism.

1-14. BACK COVER AND END CAP ASSEMBLY. This assembly serves as a housing for the Center Section and Motor Mount Assemblies. Attached to this assembly are the operating controls for the entire unit: lamp intensity potentiometer, sweep selector switch, and camera data chamber lamp switch. The end cap is separated from the back cover by three cooling fins. There is a one-ampere fuse inserted on the left side of the back cover providing readily accessible fuse protection.

1-15. ELECTRICAL SYSTEM. The Radar Recording Test Set wiring diagrams are shown in figures 1-3 and 1-4.

SECTION II

SPECIAL SERVICE TOOLS

2-1. SPECIAL SERVICE TOOLS.

2-2. There are no special tools required for servicing the Radar Recording Test Set LM18.

SECTION III

PREPARATION FOR USE, STORAGE, OR SHIPMENT

3-1. GENERAL.

3-2. The Radar Recording Test Set has a metal shipping container (carrying case) in which the set is shipped. This case is designed for both shipping and storing the unit. See figure 3-1.

3-3. PREPARATION FOR USE.

3-4. The following is a step-by-step procedure for preparing the LM18 Test Set for use:

- a. Remove the test set from its carrying case.
- b. Install viewing hood to the test set and secure with the Dzus button (figure 1-1).
- c. Load the 0-15 camera magazine with film and attach to the camera.
- d. Use the four 8-32 screws provided and mount the camera upon the periscope (figure 3-2).

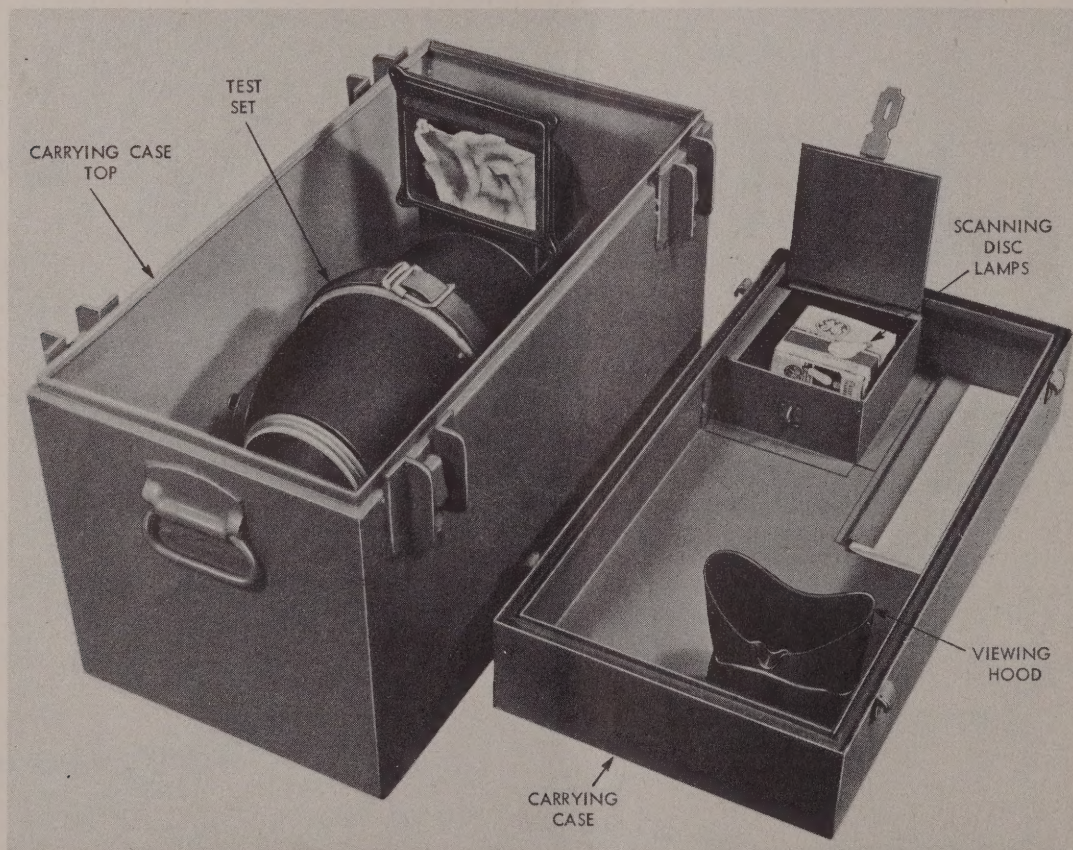


Figure 3-1. Radar Recording Test Set Carrying Case

e. Attach the circuit cable between the Jones plug on the test set and the connector on the camera.

f. Turn the scanning disc control labeled "OFF-PPI-SECTOR" to the "OFF" position (figure 1-1).

g. Connect the power cord with the plug to 110-volt AC power supply (figure 3-2).

h. Connect the power cord with the base terminals to a 28-volt DC power supply.

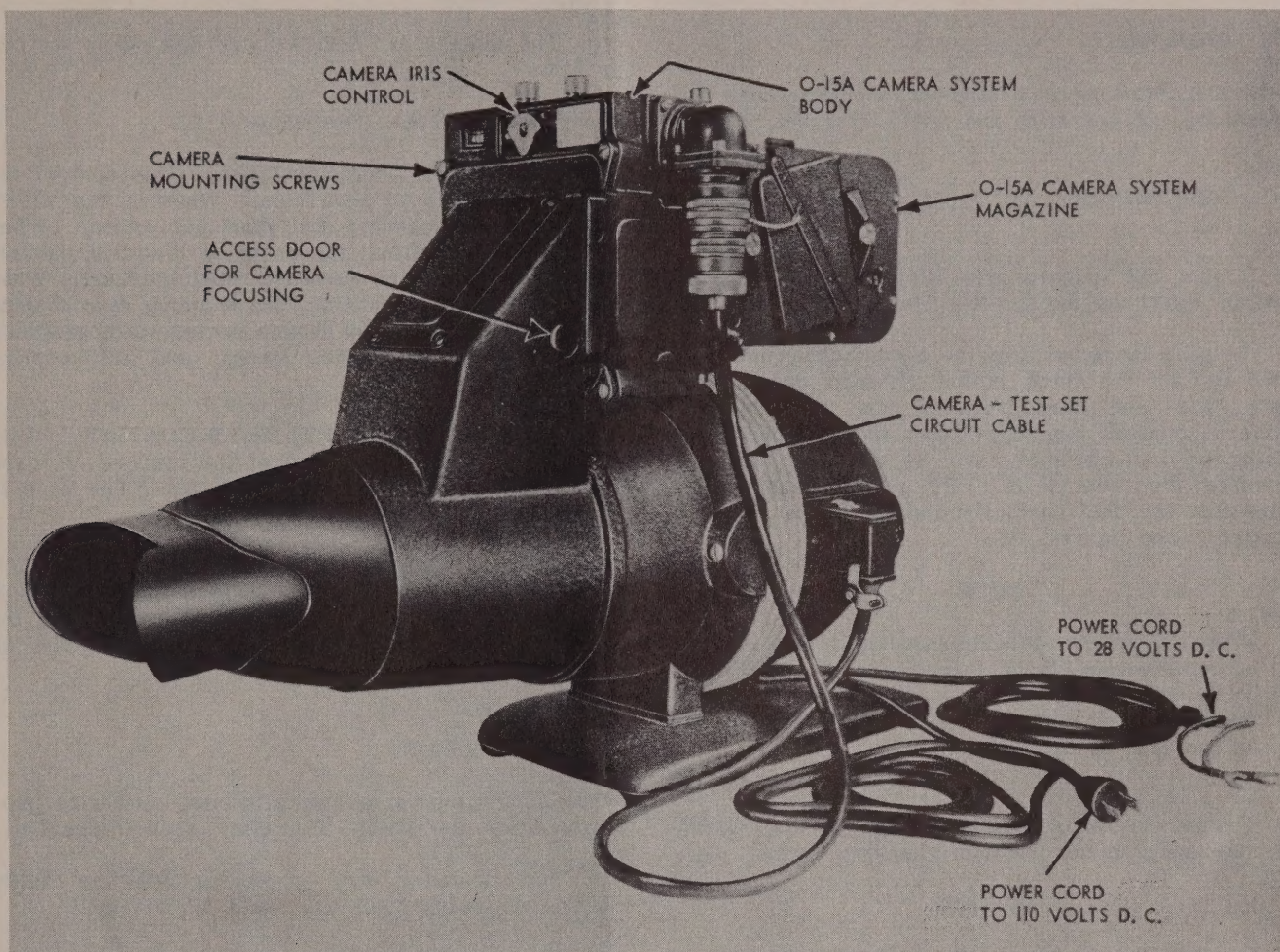


Figure 3-2. Test Set Ready for Operation

SECTION IV

OPERATING INSTRUCTIONS

4-1. GENERAL.

4-2. The following is a step-by-step procedure for preparing and operating the LM18 Test Set.

4-3. PRELIMINARY ADJUSTMENTS. (See figure 3-2.)

a. Adjust the camera iris diaphragm to the "f" setting recommended for the film being used.

b. Remove the cover from the camera data chamber, wind and set the clock, notate pertinent data on the data card, and zero both internal and external camera counters (see applicable technical orders). While the data chamber cover is still off, turn the scanning disc control to "PPI" position and determine that the data card illuminating lamps are operating. See figure 1-1.

NOTE

The 0-15 camera data illuminating lamps are on continuously during operation of the LM18 Test Set. Intensity can be adjusted by turning the camera data chamber intensity control on the side of the test set.

c. Return the scanning disc control to the "OFF" position and replace the data chamber cover.

CAUTION

Be sure the scanning disc control is in the "OFF" position before replacing the data chamber cover on the 0-15 camera. If the control is not in the "OFF" position, the cover may cause a short circuit in either or both of the data lamp circuits.

d. Select the proper sweep trace intensity by adjusting the scanning lamp intensity control knob (see figure 1-1) at the rear of the test set. It is anticipated that films of a variety of age will be used, and the optimum intensity for any grade film can be best determined by experimentation.

NOTE

The mechanical operating characteristics of the camera may vary under different load conditions on either the take-up spool or core. Recordings in each case should be made with an equal and small (approximately 5 feet) amount of film on both the take-up and supply spools.

e. The camera and test set are now ready for operation.

4-4. CONTROLS. (See figure 1-1.)

4-5. SCANNING DISC CONTROL. This control selects the mode of operation. When in the "OFF" position, the scanning disc does not rotate. When in the "PPI" position, the scanning disc continuously rotates clockwise as viewed through the hood. When in the "SECTOR" position, the scanning disc sweeps back and forth in a 90 degree sector, photographing on the counterclockwise sweep, and transporting film clockwise.

4-6. SCANNING DISC INTENSITY CONTROL. This control, located at the back of the test set, is used to control sweep scan light intensity. The knob is turned clockwise to increase intensity.

4-7. CAMERA DATA CHAMBER LAMP INTENSITY CONTROL. This control, located on the side of the test set, is used to control the intensity of the data chamber lamp. The knob is turned clockwise to increase intensity.

4-8. OPERATION.

4-9. The following is a step-by-step operating procedure for the LM18 Test Set. (See figure 1-1.)

a. Turn scanning disc control to "PPI" or "SECTOR," depending upon the mode to be tested.

b. The set will now function until the film is exhausted in the camera.

c. After film has been exhausted, turn the scanning disc control to "OFF." This will stop the set.

d. Remove the camera from the periscope.

e. Remove the film from the camera.

f. Process the film.

4-10. EVALUATION OF TEST RESULTS.

4-11. The LM18 Test Set functions to provide a pattern of concentric images upon film in the camera. After processing the film, an evaluation of the characteristics of the concentric rings provides data on picture steadiness and pull-down time.

4-12. STEADY FILM. Figure 4-1 is an illustration of a test pattern which indicates a picture taken with steady film.

4-13. **SHIFTED FILM.** Figure 4-2 illustrates a typical pattern if the film has shifted during exposure.

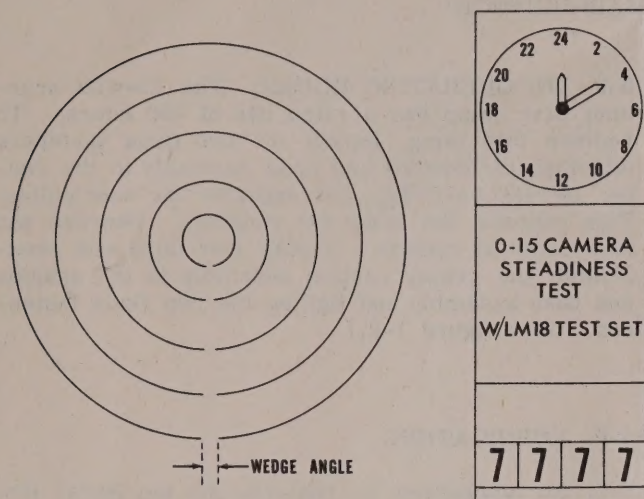


Figure 4-1. Steady Film Pattern

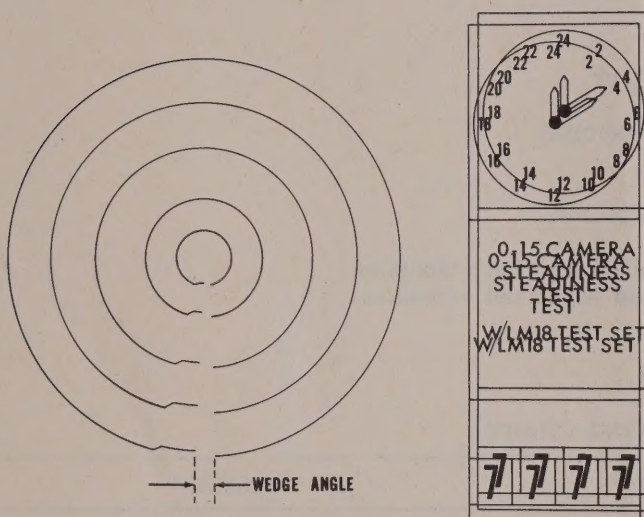


Figure 4-2. Shifted Film Pattern

4-14. **IMPROPER SHUTTER OPENING.** Figure 4-3 is an illustration of a typical pattern if the shutter opens during film transport. Pull-down time is the interval that the shutter is closed and the sweep is not being recorded. Note the difference between the "transport wedge" in figure 4-1 and that in figure 4-3.

NOTE

Rotation of the target sweep at 25 revolutions per minute is an angular velocity of one degree every 6.7 milliseconds. In the case of the 0-15 camera, the correct wedge angle is 4.95 degrees, representing the 33.2 milliseconds that the shutter is normally closed. To make accurate measurements requires that the photographs be enlarged at an enlargement ratio of nine diameters.

4-15. **CORRECTING CAMERA DEFICIENCIES.**

4-16. If test patterns indicate faulty or improper operation, refer to the applicable technical order for correction of deficiencies discovered during the test.

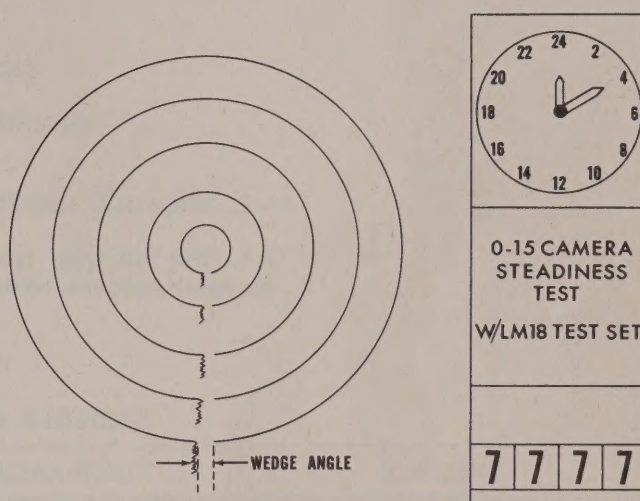


Figure 4-3. Shutter Opening during Film Transport

SECTION V

INSPECTION AND MAINTENANCE

5-1. GENERAL.

5-2. The test set design is such that it requires a minimum of inspection and field maintenance.

5-3. INSPECTION AND MAINTENANCE.

5-4. 100 OPERATING HOURS (6 MONTHS). The Radar Recording Test Set should be inspected every 100 operating hours or every six months, whichever occurs earlier. The optical components; mirrors, lights, filters, and bulb should be dusted as necessary with a soft camel hair brush or lens tissue.

NOTE

To avoid the troublesome removal of finger prints, do not handle the optical components.

5-5. 300 OPERATING HOURS. The 25-watt scanning disc lamp has a rated life of 300 hours. To replace this lamp, loosen the two Dzus fasteners attaching the adaptor and base assembly to the center section assembly, and separate the assemblies. This exposes the lamp for removal. Depress and turn lamp to remove. Install new lamp and reassemble the center section assembly to the adaptor and base assembly and tighten the two Dzus fasteners. (See figure 1-2.)

5-6. LUBRICATION.

5-7. No lubrication is required for the Radar Recording Test Set.

SECTION VI

TROUBLE SHOOTING

6-1. TROUBLE SHOOTING CHART.

6-2. The following trouble shooting chart tabulates the most common troubles and suggested remedies.

TABLE I

TROUBLE SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Test set fails to operate.	Power cords not connected to power source.	Connect the power cords to power source (paragraph 3-2).
	Fuse burned out.	Install new fuse on side of test set.
Scanning disc lamp fails to operate.	Lamp burned out.	Install new lamp (paragraph 5-5).
Scanning disc lamp intensity is not proper.	Control setting too low.	Turn control to increase intensity (paragraph 4-6).

